Wingate University Chemical Hygiene and Safety Plan

Version 2.2

Approved by:
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I. Wingate Chemical Hygiene and Safety Plan

A. Scope

1. This document serves as the written Chemical Hygiene and Safety Plan (CHSP) for laboratories and areas of operations at Wingate University that use hazardous chemicals or are exposed to potential hazards in the workplace. The policies set forth in this CHSP are applicable to all University employees (both faculty and staff) and students. The CHSP is a regular, continuing effort to improve safety and not a standby or short term activity. If Departments, divisions, sections, or other work units engage in work whose hazards are not sufficiently covered in this manual, then they must submit appropriate section (e.g. standard operating procedures, emergency procedures, identifying activities requiring prior approval) to address the hazards.

B. Purpose

1. This Chemical Hygiene and Safety Plan is designed to cover the safe operations of the chemicals, hazardous material, and hazardous work situations at Wingate University. The campus-wide plan will focus on the Department of Chemistry and Physics, the Department of Biology, the School of Pharmacy, the Physician Assistants Program, the Physical Therapy Program and Maintenance. Other areas, such as the Department of Art, the Department of Nursing, and the Health Center, will be included as warranted by their chemical and hazardous materials usage.

2. This CHSP is designed to identify the safety practices that should be implemented when working with the common hazardous chemicals that are found throughout the campus. These guidelines are meant to protect students, faculty, and staff from unsafe conditions in most situations. It is the policy of Wingate University to prevent injuries to its students, faculty, employees, and visitors, and to protect its property from damage.

3. The policies and procedures in this Chemical Hygiene and Safety Plan are applicable to all operations and personnel within the University, which include laboratory personnel, faculty, staff and students.

4. The primary responsibility for safety rests with the individuals who are engaged in the education, research, and support activities at Wingate University. Professional judgment is essential in the interpretation and application of these procedures, and the faculty and staff may modify or enhance these procedures to meet their specific uses and needs. As part of the community, it is important for each worker to be familiar with the health and safety guidelines that apply to his/her work and to conduct that work in the safest possible manner. The Chemical Hygiene and Safety Plan is a resource to assist workers in fulfilling these responsibilities.

C. Authority and Responsibilities

1. President of the University.
   - **a)** Provides the support and direction for the safety and chemical hygiene for the University.
   - **b)** Approves and issues the CHSP.

c) Appoints the Vice President of Operations with the authority to implement the provisions of this plan.

d) Conducts periodic meetings with the Vice President of Operations, the Chief of Campus Safety, and the Safety Coordinator to discuss the safety and chemical hygiene activities on campus.

2. Vice President of Operations
   a) Provides the oversight of the chemical hygiene and safety operations of the University.
   b) Provides assistance in the preparation of the CHSP and forwards the CHSP to the President for final approval.
   c) Appoints to Chief of Campus Safety and provides oversight of all safety and chemical hygiene matters.
   d) Appoints the Campus Safety Coordinator who provides the leadership for the implementation of the CHSP.
3. Chief of Campus Safety
   a) Charged with the safety and security of the University.
   b) Works with the Safety Coordinator in the implementation of the CHSP.
4. Campus Safety Coordinator (CSC)
   a) Works with the University faculty and employees to develop and implement appropriate chemical hygiene practices.
   b) Ensures that appropriate inspections and audits are conducted.
   c) Reviews the reports of spills, accidents, and personal exposures; provides assistance with corrective actions; and prepares the appropriate reports.
   d) Knows the current legal requirements and communicates them to the University personnel.
   e) Provides the regular training on the CHSP.
   f) Chairs the University Safety Committee and directs its activities, including the annual review and updating of the CHSP
   g) Works with Department Chair, faculty, and staff to implement the CHSP.
   h) Ensures that hazardous waste generated on campus is handled and disposed of in accordance with the Department of Transportation (DOT), the Occupational Health and Safety Administration (OSHA), the State of North Carolina Department of Environmental and Natural Resources, and the Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA) requirements.
   i) The authority and responsibility for implementation of CHSP at the operational level are delegated to the Safety Officer or Coordinator in each Departments or area. To fully implement the chemical hygiene and safety policies, the assistance and cooperation of all university personnel is necessary.
5. Department Chair (or Area Director)
   a) Is responsible for chemical safety in the Department and understands the goals of the CHSP.
   b) Shall appoint a Department Safety Officer or Coordinator who will assist in the implementation of the CHSP. The Department Safety Officer may

assume many of the responsibilities listed below and will report to the Department Chair.

c) Ensures that faculty or staff members know and follow the practices in the CHSP.

d) Provides information and specific training to new faculty on the chemical hazards and provides additional training when new hazards are introduced.

e) Ensures regular chemical hygiene and housekeeping inspections, including routine inspections of all emergency equipment.

f) Reports spills, accidents, and personal exposures promptly to the CSC and assists in the cleanup and any investigation.

g) Ensures that a current inventory of chemicals is available and accurate.

h) Maintains a set of Safety Data Sheets (SDS) for all chemicals within the Department.

6. Faculty and Staff
   - **a)** Plans and conducts experiments in accordance with the CHSP.
   - **b)** Develops good chemical hygiene habits.
   - **c)** Informs and trains the students in their areas in good chemical hygiene habits.
   - **d)** Reports spills, accidents, and personal exposures to the Department Chair or Safety Officer.
   - **e)** Develops operating procedures and policies for the handling and disposal of hazardous material that are generated in their area.
7. Students
   - **a)** Understand the laboratory procedure or work assignment before attempting an experiment or work.
   - **b)** Know the operation of the equipment involved in the experiment or work.
   - **c)** Develop good chemical hygiene habits.
   - **d)** Report spills, accidents, and exposures to the instructor or supervisor.
8. University Safety Committee
   - **a)** Assists the CSC in the conduct of his/her duties.
   - **b)** Participates in the annual review of the CHSP.
   - **c)** Assists in chemical hygiene and housekeeping inspections.
   - **d)** Ensures that appropriate controls are available to protect workers.

II. OSHA Standards and Requirements

A. The OSHA Laboratory Standard

1. The basis for this standard (29 CFR 1910.1450) is a determination by the Occupational Safety and Health Administration (OSHA) that laboratories typically differ from industrial operations in their use and handling of hazardous chemicals and that a different approach than that found in OSHA's substance specific health standards is warranted to protect workers. The final standard applies to all laboratories that use hazardous chemicals in accordance with the definitions of laboratory use and laboratory scale provided in the standard. Generally, where this standard applies, it supersedes the provisions of all other standards in 29 CFR, part 1910, subpart Z, except in specific instances as identified by this standard.

2. For laboratories covered by this standard, the obligation to maintain employee exposures at or below the permissible exposure limits (PELs) specified in 29 CFR, part 1910, subpart Z is retained. However, the manner in which this obligation is achieved will be determined by each employer through the formulation and implementation of a Chemical Hygiene Plan.
3. The Chemical Hygiene Plan must include the necessary work practices, procedures, and policies to ensure that employees are protected from all potentially hazardous chemicals used or stored in their work area. Hazardous chemicals, as defined by the final standard, include not only chemicals regulated in 29 CFR part 1910, subpart Z, but also any chemical meeting the definition of hazardous chemical with respect to health hazards as defined in OSHA's Hazard Communication Standard, 29 CFR 1910.1200(c).
4. Among other requirements, the final standard provides for employee training and information, medical consultation and examination, hazard identification, respirator use and record keeping. To the extent possible, the standard allows a large measure of flexibility in compliance methods.

B. Hazardous Chemicals

1. The Laboratory Standard defines a hazardous chemical as any element, chemical compound, or mixture of elements and/or compounds which is a physical or health hazard.
2. A chemical is a physical hazard if there is valid evidence that it is an explosive, a compressed gas, a flammable or combustible liquid, a flammable, pyrophoric, or water-reactive solid, an oxidizer, an organic peroxide, or unstable material.
3. A chemical is a health hazard if there is significant evidence that acute or chronic health effects may occur in exposed employees. Included are: toxics, radioactive materials, corrosives, carcinogens, reproductive toxins, sensitizers, irritants, biohazards, neurotoxins (nerve), hepatotoxins (liver), nephrotoxins, (kidney), agents that act on the hematopoietic system (blood), and agents that damage the lungs, skin, eyes, or mucous membranes. See the Appendix and Glossary for definitions of these terms.
4. In most cases, the label will indicate if the chemical is hazardous. Look for key words like danger, warning, caution, hazardous, toxic, dangerous, corrosive, irritant, carcinogen, etc. Old containers of hazardous chemicals (before 1985) may not contain hazard warnings.
5. If you are not sure a chemical that you are using is hazardous, review the Safety Data Sheet (SDS) or contact your supervisor, instructor, the Department Chair, the Department Safety Officer, or University Safety Committee.
6. Designated areas must be established and posted for work with certain chemicals and mixtures, which include select carcinogens, reproductive toxins, and/or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood. Designated area stickers are available from the University Safety Committee.

C. Safety Data Sheets (SDSs)

1. A Safety Data Sheet (SDS) is a document containing chemical hazard and safe handling information prepared in accordance with the OSHA Hazard Communication Standard.

2. Chemical manufacturers and distributors must provide a SDS the first time a hazardous chemical/product is shipped to a facility. (Many manufacturers and distributors consider Wingate University the facility.)
3. Only SDSs received must be retained and made available to workers. However, you can request a SDS for any chemical from the manufacturer or distributor.
4. If you want to review an SDS, contact your supervisor, instructor, Department Chair, the Department Safety Officer, or the University Safety Committee. If you need an SDS for your work area file, contact the chemical supplier.

D. Chemical Inventories

1. The OSHA Laboratory Standard does not require chemical inventories; however, it is prudent to adopt this practice. An annual inventory can reduce the number of unknowns and the tendency to stockpile chemicals.
2. Wingate University requires that a chemical inventory be prepared for a room, work unit, or Department.

E. Exposure Limits

1. For laboratory uses of hazardous substances, Departments must ensure that employees' exposures to such substances do not exceed either the permissible exposure limits (PELs) specified in 29 CFR 1910, subpart Z, which are set by the OSHA, or the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH), whichever is lower.

F. Employee Rights and Responsibilities

1. Employees have the right to be informed about the known physical and health hazards of the chemical substances in their work areas and to be properly trained to work safely with these substances.
2. Employees have the right to file a complaint with OSHA if they feel they are being exposed to unsafe or unhealthy work conditions. Employees cannot be discharged, suspended, or otherwise discriminated against by their employer because of filing a complaint, or exercising their rights under the law.
3. Employees have the responsibility to attend training seminars on the Laboratory Standard and Chemical Hygiene and Safety Plan and to stay informed about the chemicals used in their work areas.
4. Employees have the responsibility to use safe work practices and protective equipment required for safe performance of their job.
5. Employees have the responsibility to inform their supervisors of accidents and conditions or work practices they believe to be a hazard to their health or to the health of others.

G. Employee Information

1. The University Safety Committee must provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area and the steps they should take to protect themselves from these hazards. Training may take the form of individual instruction, group seminars, audio-visual presentations, handout material, or any combination of the above.
2. Such information must be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignment involving new exposure situations.

3. Employees should receive periodic refresher information and training which will vary with the hazard and when new information is provided.

H. Employee Training

1. Persons working in areas where there is the potential for exposure to hazardous chemicals shall be provided with information and training to ensure that they are aware of the hazards of chemicals present in these areas prior to beginning work.
2. General Hazmat training, provided by the University Safety Committee, is available to assist Departments in meeting the general information requirements of the CHSP. This training shall include the following:
   - **a)** Methods and observations that may be used to detect the presence and/or release of a hazardous chemicals
   - **b)** Identification of the physical and health hazards of chemicals in the work area
   - **c)** Information on labeling and access to and use of SDSs
   - **d)** The signs and symptoms associated with exposure to hazardous chemicals used in their work area
3. The measures that persons can take to protect themselves from these hazards should be included in specific procedures contained in CHSP. Such measures include appropriate work practices, safety sections of procedures, emergency procedures, and PPE.

I. Identification of Potential Hazards

1. Everyone on Campus is responsible for recognizing potential hazards in their work areas. This responsibility requires understanding and familiarity with processes, maintenance of chemical and physical inventories, and periodic review of activities in the work area.
2. Departments shall routinely review existing control methods.

J. Training Materials

1. The following materials, at a minimum, will be distributed in each initial training program:
   - a) Right to Know fact sheet
   - b) Laboratory Standard fact sheet
   - c) List of key emergency telephone numbers.
   - d) Sample SDS and fact sheet on how to read
   - e) Chemical storage scheme chart
   - f) List of hazard classes and chemical examples
   - g) Hazard review checklist
   - h) Laboratory inspection form
   - **i)** Incident report form

K. Refresher and New Hazard Training

1. Training for experienced workers will be scheduled whenever new hazards are introduced, and when lab or work conditions or practices change.
2. Refresher training will be scheduled or integrated into other lab or work activities as needed.
3. The training will be coordinated by the CSC.

L. Recordkeeping

1. The University Safety Committee will maintain all records of employee, faculty and staff that have trained throughout the entire campus.
2. Each Department must maintain records of all training sessions, including agendas, handouts, sign-in sheets, course data, and the number of hours participants attended. Copies of these records must be provided to the CSC after each training session. The CSC will maintain training records for three years.
3. Information that is provided by the Departments to employees must include:
    a) The Chemical Hygiene and Safety Plan along with the Appendices
    b) The permissible exposure limits for OSHA regulated substances or published exposure limits for other hazardous chemicals where there is no applicable OSHA standard.
    c) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory (available on container labels and on the SDS.
    d) The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in laboratory but not limited to the SDS received from the supplier or manufacturer.
4. Specific Departmental training will be handled by the Department Chair which must include:
    a) Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the University, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.)
    b) The physical and health hazards of chemicals in the work area
    c) The measures employees can take to protect themselves from these hazards, including specific procedures the University or Department has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used;

III. An Overview of the Use of Hazardous Materials on Campus

A. Hazardous Chemicals:

1. A hazardous classification is given to a chemical based on the following.
    a) It has a physical hazard (i.e., flammable, corrosive, reactive, explosive, radioactive, or combustible). As noted on the Safety Data Sheets.
    b) It has been evaluated and designated as hazardous by the manufacturer;
    c) It is listed in 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances;
    d) It is classified as a hazardous waste.

B. Hazardous Material Classes

A more complete description is given in the Appendix.

1. Class 1. Explosives
    a) Any chemical compound, mixture, or device whose primary or common purpose is to function by explosion, that is, with almost instantaneous release of gas and heat.
    b) There are six subclasses of explosives that depend on the explosive characteristics.
    c) No explosives are currently used on campus.

d) The use of explosive compounds requires special procedures and facilities. Therefore, any use of explosives must be approved by the CSC.

2. Class 2. Compressed Gases
   a) These chemicals are normally a gas at room temperature and pressure and are stored in pressurized cylinders.
   b) There are three subclasses with particular identifiable characteristics.
      (1) Class 2.1 Flammable Gases
      (2) Class 2.2 Non-Flammable Gases
      (3) Class 2.3 Poisonous Gases
   c) Compressed gases such as nitrogen, oxygen, helium, hydrogen, and acetylene are commonly found the Department of Chemistry & Physics, Department of Biology, and Maintenance.
3. Class 3. Flammable Liquid
   a) There is only one class of flammable liquids, but it is organized into three sub-classifications that are based on the flashpoint and the boiling point.
   b) A Combustible Liquid has a higher flashpoint range than the Flammable Liquids but are not given a separate Hazardous Materials Class number designation,
   c) Typical flammable liquids that are found across campus are gasoline, alcohols, acetone, ethers, and paint thinners. They are commonly found the Department of Chemistry & Physics, Department of Biology, and the Maintenance.
4. Class 4. Flammable Solid
   a) There are three subclasses with particular characteristics:
      (1) Class 4.1 Flammable Solid
      (2) Class 4.2 Spontaneously Combustible
      (3) Class 4.3 Dangerous When Wet
   b) There are a few flammable solids in the Department of Chemistry & Physics such as sodium, potassium, and hydrides.
5. Class 5. Oxidizing Material
   a) There are two subclasses with particular characteristics.
      (1) Class 5.1 Oxidizers
      (2) Class 5.2 Organic peroxides
   b) Common oxidizers and organic peroxides are typically found in the Department of Chemistry & Physics and only a few.in the Department of Biology.
6. Class 6. Poisons
   a) There are three subclasses with particular characteristics.
      (1) Class 6.1 Poisonous material
      (2) Class 6.2 Infectious material
      (3) Class 6.3 Poisonous Gas
   b) Irritants are considered as part of the Poison Class but do not have a separate class number.
   c) Only a small amount of poisons is located in the Department of Chemistry & Physics and the Department of Biology. Maintenance may have insecticides, etc. that may be classified as a Class 6 Poison.

d) There are no Class 6.3 Poisonous Gases in use on Campus.
e) Any use of Class 6.3 Poisonous Gases must be approved by the CSC.

7. Class 7. Radioactive Materials
   a) Radioactive materials spontaneously emit nuclear radiation (alpha, beta, or gamma) and are divided into three subclasses that are based on their activity.
   b) No radioactive materials are currently used on the Campus,
   c) Any use of radioactive materials must be approved by the CSC
8. Class 8. Corrosive Materials
   a) Corrosive materials are liquids or solids that are capable of the destruction of body tissue.
   b) There are no subclasses for corrosive materials.
   c) The primary corrosive materials that are found in the Department of Chemistry & Physics and the Department of Biology are the concentrated acid and base solution. Maintenance may have drain cleaners or battery acids that would be included as corrosive materials.
9. Class 9. Miscellaneous
   a) The Miscellaneous Class includes any other material that presents a hazard but is not assigned to another class.
   b) Except for dry ice, iodine, and hazardous waste, there are very little Class 9 materials on Campus.

C. Materials with Special Hazards

1. Health Hazards
   a) A chemical is defined as a health hazard if there is accepted evidence that acute or chronic health effects may occur upon exposure.
   b) This term includes, but is not limited to, chemicals that are toxic or highly toxic, carcinogens, reproductive toxins, corrosives, sensitizers, and agents that act on the specific body systems.
2. Allergens and Contact Hazards
   a) Allergens are substances that can cause skin and lung hypersensitivity.
   b) Suitable gloves and air masks should be used to prevent contact with allergens or substances of unknown allergenic activity
3. Reproductive Hazards
   a) Reproductive hazards include chemical, biological, and physical hazards that may affect the reproductive health of both males and females.
   b) When a pregnancy is planned or first suspected, it is recommended that the person should notify the Department Chair who, in turn, will notify the CSC. A survey of the work area will be conducted and appropriate actions will be taken if hazards are found to reduce the hazard risks.
4. Reactive Chemicals
   a) Reactive chemicals include compounds that are classified as an oxidizer, an organic peroxide, an explosive, or reacts violently water.
   b) A fuller description is provided in the Appendix.
   c) Due to the wide variety of chemicals within this grouping, reactive chemicals may be found in many areas across campus.
5. Process Hazards

a) Process hazards include, but are not limited to, any of the following:
   (1) Exothermic reactions
   (2) Cryogenic materials or endothermic reactions
   (3) High vacuum or pressure
   (4) Electrical hazards
   (5) Hazards associated with machinery and tools (e.g. belt guards)
   (6) Compressed gases

IV. Standard Operations Procedure for Chemical Management

A. Chemical Procurement

1. Before a chemical is ordered, information on proper handling, storage, and disposal should be known. Only minimum required amounts should be purchased.
2. No container should be accepted without an adequate identifying label and hazard information.

B. Chemical Inventory

1. Each Department is responsible for developing and maintaining an accurate inventory of all chemicals used and stored within the Department.
2. Under the Right-to-Know statutes, the inventory of each Department must be reported to the CSC every six months.
3. The CSC shall maintain a master inventory of all chemicals (and their storage locations) that are used on Campus

C. Chemical Storage

1. The normal chemical storeroom is adequate for materials with low hazard potential.
2. Every chemical will have an identifiable storage place and must be returned to that location after use.
3. All chemicals containers will be dated when they are initially received and when they are first opened.
4. Expiration dates will be assigned to those chemicals that may decompose over time. When provided, the manufacturer's expiration dates shall be used.
5. A storage scheme must be developed in each chemical storage area to ensure the segregation of incompatible chemicals.
   a) An effort must be made to isolate particularly flammable, reactive, and toxic materials.
   b) Because of the risk of placing incompatible materials side by side, a storage scheme based solely on alphabetizing is not reccomended.
6. Special attention must be paid to the storage of the following chemicals because of their potential instability or reactivity.
   a) Peroxide-forming chemical (explosive)
   b) Perchlorates and perchloric acid (oxidizers)
   c) Nitrates, nitrites, and azides (oxidizers)
   d) Monomers that may autopolymerize (exothermic reaction)
   e) See the Appendix for a more complete list.
7. Stored chemicals must not be exposed to direct sunlight or heat.
8. Labels must be maintained on all stored materials.
9. Large containers shall be stored on lower shelves.
10. Chemicals will not be stored on the floor.

11. Chemical storage in hoods shall be kept to a minimum. Storing containers inside the hood interferes with airflow, reduces the work space, and increases the risk of a spill, fire, or explosion.
12. Stored chemicals should be examined periodically for deterioration and container integrity. Unneeded items should be set aside for disposal.
13. Except when material is being transferred, keep chemical containers tightly closed.
14. Refrigerators and freezers used for storage of chemicals or other laboratory supplies must be posted "No Flammables or Combustibles" if they have internal sources of ignition.
15. No flammable liquids are to be stored in household-type refrigerators.
16. Do not store food or drinks for human consummation in laboratory refrigerators or freezers.
17. Appropriate spill-control, cleanup, and emergency equipment must be available wherever chemicals are stored.
18. The storage of working containers on bench tops will be minimized to prevent the accidental spilling of chemicals and to reduce the risk of fire.

D. Chemical Transportation

1. Extreme caution should be used in transporting chemicals within facilities, from building to building, or from stockroom to laboratory.
2. Depending on the specific hazard, hand carried chemical should be placed in a secondary container to protect against breakage. The approved container should be made of rubber, metal, or plastic with carrying handles. Carrier lids or covers are recommended but are not required. Rubber or plastic should be used for acids/bases; and metal, rubber, or plastic for organic solvents.
3. Wheeled carts used to transport chemicals shall be stable and move smoothly over uneven surfaces without tipping or stopping suddenly, and shall have lipped surfaces that would contain the chemicals if the containers break or tip over and there is a spill.
4. Freight elevators, not passenger elevators should be used to transport hazardous chemicals whenever possible. The individual(s) transporting the hazardous chemicals should operate the elevator alone if possible.

E. General Requirements for All Stockrooms

1. Stockroom access must be limited to authorized personnel. All laboratories, preparation rooms, and storeroom/stockrooms must be secured when designated laboratory employees are not present.
2. Each storage area must have at least one large sink, safety shower, eyewash station, and appropriate fire extinguisher with adequate extinguishing capacity.
3. Emergency equipment shall be located next to the exit door and also within 25 feet of a hazardous area. Emergency equipment cannot be obstructed.
4. Shelving must be secure and well-braced. The weight limit provided by the manufacturer of the shelving unit must not be exceeded. Other shelving characteristics shall include:
    a) Metal shelves shall be corrosion-resistant.
    b) Aisles at least 3 feet between standing shelving

5. All chemical storerooms and stockrooms must have clearly marked unobstructed exits.
6. Chemical stockrooms must be well-lit so that labels can be easily read.
7. Aisles must be kept clear of clutter. Material cannot be stored in a means of egress.
8. The environment in stockrooms must be controlled to avoid extremes of temperature and high humidity.
9. Open flames, smoking, humidifiers, and heating units such as space heaters, hot plates and coffee makers are not permitted.
10. Floors must be kept clean and dry. If being cleaned or when a spill has occurred, signs shall be posted to warn of hazard.

F. Chemical Storage Outside of the Stockrooms (in Laboratories)

1. The nature of laboratory work calls for a certain amount of chemicals to be on hand for easy access. However, all laboratory employees must limit, as much as possible, the amounts of chemicals stored on bench tops, in hoods, under sinks, or other exposed areas.

G. Signs and Labels

1. Signs and labels should be displayed as described below.
2. Chemical Labels are affixed to, printed on, or attached to the container of a hazardous chemical, or the outside packaging.
3. Chemical manufactories, importers and distributors are responsible for labeling, tagging, or marking each container.
4. The label must be displayed in English on each container and must include name, address and telephone number of the manufacturer, importer or responsible party.
5. Each primary chemical container should be labeled as to the name and address of the manufacturer, content, date opened, expiration date (if applicable), and a hazard warning indicating the health or safety hazard, corrosiveness, carcinogenicity, water reactivity, flammability, and target organs.
6. Secondary containers (dilutions, solutions, or mixtures of chemicals used in normal laboratory operations) need only be labeled with the identity and concentration of the chemicals and the date of preparation.
7. Refrigerators and freezers should be clearly labeled as to permitted contents.
8. Signs shall be posted on laboratory doors showing entry requirements and any special hazards.
9. Chemical container labeling will be assessed in the routine inspections of laboratories storage areas. Questions on the use and type of containers shall be referred to the CSC.
10. Employees should know how to read chemical labels and understand the information presented before dealing with chemicals.
11. Special Labeling Requirements:
    a) All containers that hold carcinogens, reproductive hazards or acutely toxic reagents must be properly labeled concerning the health hazard posed by the chemical.
    b) Most new reagent containers will have the chemicals hazard clearly displayed on the label.

H. Safety Data Sheets (SDS)

1. **The SDS** is a standardized, 16-section, detailed information bulletin prepared by the manufacturer and was formally known as Material Safety Data Sheets (MSDS).
2. SDSs are required to be supplied for initial shipment of a chemical from a manufacturer.
3. SDSs should be readily accessible during each work shift to employees in their work area.
4. Electronic access, microfiche and other alternatives to paper copies are permitted as long as no barriers to immediate access are created.
5. Chemicals identified as trade secrets by the University shall be identified as such, but shall require documentation stored in a place accessible to the user in case of emergency.
6. Any faculty, staff, or student may request access to an SDS for a particular chemical.
7. Whenever "new or significant" information regarding a chemical's hazard potential is realized, manufactures have up to three months to update the SDS. Therefore every six months, all SDSs will be cross-references to ensure the list and the SDSs are accurate and correctly reflect the number of chemicals in the workplace.

V. Medical Program

A. All persons who have reason to believe that they were exposed to hazardous chemicals or who develop signs or symptoms of a chemical exposure must be provided with an opportunity to receive appropriate medical attention at no cost for the employee. The University Safety Committee should also be notified when such actions occur.

B. Whenever an event takes place, such as a spill, leak, explosion, or other occurrence that results in the likelihood of a hazardous exposure, the affected persons shall be provided the opportunity for medical consultation. Such consultation at the Health Center shall be for the purpose of determining the need for further medical care.

C. The person shall provide the physician with information on the identity of the suspected hazardous chemical, the conditions under which exposure occurred (including quantitative exposure data, if available), and a description of any signs and symptoms of exposure.

D. When exposure is at a level routinely above the action level [one-half the threshold limit value (TLV) or permissible exposure limit (PEL), whichever is lower] for an OSHA-regulated substance, special exposure monitoring and medical surveillance should be implements in consultation with the CSC.

E. For any examination or consultation performed for purposes of compliance with this program, documentation shall include:
   1. Results of the medical examination and any associated tests,
   2. Recommendations, if appropriate, for further medical follow-up,
   3. Any medical condition that may be revealed in the course of the examination which may place the person at increased risk from exposure to a hazardous chemical found in the workplace, and
   4. A statement that the person has been informed by the physician of the results of the consultation or examination and of any medical condition that may require

further examination or treatment. The written opinion shall not reveal specific findings of diagnosis unrelated to occupational exposure.

5. Medical records shall be retained by the institution in accordance with state and federal regulations.

VI. Standard Operating procedures for All Laboratories

Laboratory operations are defined as the handling or manipulation of chemicals in reactions, transfers, etc. in small quantities on a non-production basis.

A. General Laboratory Rules

1. Never store food or drinks for human consumption, or utensils or equipment for preparing food or drink in the same cabinet, drawer, refrigerator or freezer with chemicals or equipment used with chemicals.
2. Do not eat, drink, smoke, chew gum, take medicine, or apply cosmetics in laboratories where chemicals or other hazardous materials are present.
3. Mouth piping of pipettes is strictly prohibited. Always use a pipette bulb or other mechanical pipette filling device.
4. Wash areas of exposed skin well with soap before leaving the laboratory.
5. Wear appropriate Personal Protective Equipment (PPE) when handling particularly hazardous chemicals. Safety glasses with side shields may not appropriate for protection with some chemicals.
6. Remove contaminated Personal Protective Equipment (e.g., gloves) before leaving the laboratory.
7. Confine long hair and loose clothing such as scarves, ties, cuffs.
8. Proper shoes are required in the laboratory at all times. No bare feet, sandals or open toed shoes are permitted at any time.
9. It is recommended to wear long-sleeved and long legged clothing.
10. Jewelry should not be worn that interferes with gloves and other protective clothing or that could come into contact with electrical sources or react with chemicals.
11. All work areas, including work benches and floors must be kept clean, dry, and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or at the end of each work day.
12. Deposit chemical wastes in their appropriate, labeled receptacles and follow all other disposal procedures described in this Chemical Hygiene Plan.
13. Dispose of broken glassware in “Glass Only” containers/boxes.
14. Dispose of non-contaminated sharps (e.g., needles) in approved sharps containers.
15. Employees and students should avoid working alone in a laboratory, if possible, when conducting research and experiments involving hazardous substances.
16. Faculty will provide direct oversight to all students while they are working in a laboratory.
17. All chemical containers, including reaction vessels and process equipment, must be labeled.
18. Use appropriate storage containers for raw materials and waste materials (e.g., approved and flammable storage cabinets).

B. Unattended Operations (After Hour Experiment)

1. An emergency phone number for the responsible person must be posted on the laboratory door.

2. A sign stating Experiment in Progress must be posted near the process.
3. The laboratory light must be kept on at all times for ease of Public Safety identification.
4. Provide for the containment of toxic substances in the event of failure of a utility service, such as cooling water. Additional controls are needed for particularly hazardous chemicals.

C. Use of Chemicals with High Toxicity and High Hazards

1. Chemicals with High Toxicity and High Hazards, and the criteria for low, medium and high hazards are given in the Appendix.
2. Work with high hazard materials should be restricted to low milligram amounts, if possible.
3. Obtain approval from the CSC of a work plan covering the use, storage, disposal, and accident response for chemicals of high toxicity.
4. All work should be done in a glove box, fume hood or bench-top hood with sufficient traps to prevent the release of the substance into the lab.
5. The work area should have special warning signs.
6. At least two people should be present at all times when working with highly toxic materials.
7. Use appropriate Personal Protective Equipment such as respirators, gloves, and eye protection.
8. To avoid skin contact, use gloves, long sleeves, and other appropriate apparel.
9. On leaving the work area, remove any protective apparel and place it in an appropriate, labeled container. Thoroughly wash hands and any other exposed areas such as hands, forearms, face, and neck.
10. Store containers of these chemicals only in a ventilated, limited access area in appropriately labeled, unbreakable, chemically resistant secondary containers.
11. If a major spill occurs outside the hood, evacuate the area and call 911.
12. Keep accurate records of the amounts of these substances stored and used, the dates of use and the names of the users.
13. Additional guidance on chemicals that fit in this category is found in Prudent Practices for Handling Hazardous Chemicals in Laboratories.

VII. The Laboratory Facility

A. Design

1. A properly designed laboratory facility will have the following features:
    a) Appropriate space and lab furniture for the safe operation of the experiments.
    b) Appropriate general ventilation system with supply air and exhaust located so as to avoid intake of contaminated air.
    c) Adequate storage areas for chemicals.
    d) Flammable and combustible liquids stored in safety cans or cabinets constructed according to requirements of Sect. 4.4 of the National Fire Protection Association (NFPA) 30.
    e) Suitable laboratory hoods and sinks.
    f) Proper arrangements for waste disposal.

B. Maintenance

1. Chemical hygiene related equipment (hoods, glove boxes, eyewash stations, safety showers, etc.) should have periodic performance evaluation and maintenance inspections. These tasks are handled by the Department Chair or Safety Officer/Coordinator on a regular schedule.

C. Usage

1. The work conducted and the scale of work must be appropriate for the physical facilities available and especially to the quality of the ventilation.

D. Housekeeping, Maintenance and Inspection

1. Floors should be cleaned regularly. If non-routine cleaning is needed, contact Maintenance.
2. Formal housekeeping and chemical hygiene inspection should be included in the quarterly safety inspection. Reports of findings should be distributed, with follow-up on corrective actions. Walk-throughs by the Department Chair should be done periodically.
3. Hallways, pipe chases, and aisles should not be used as storage areas. Access to exits, emergency equipment, and utility controls should never be blocked.

VIII. General Principles for Working with Chemicals in a Laboratory

A. Flammable Materials Stockrooms

1. Flammable materials that are not currently in use should be isolated and stored in Flammable Solvent Cabinets or a flammable storage facility.
2. Storage facilities for flammables must meet the following specifications:
    a) All doors between the rooms and the corridors should be self-closing. Smoke activated doors can remain open on magnets, but will close fully when fire alarm sounds.
    b) In areas where Class I flammable liquids are stored or dispensed, electrical power, lights, switches, and sockets must be explosion-proof.
    c) Fan motors and ventilation equipment motors must be non-sparking.
    d) All smoking and lighting of matches are strictly prohibited.
    e) Chemical storage must meet applicable local building and fire codes.

B. Flammable Liquids Storage Cabinets

1. Flammable materials must be stored in cabinets that meet OSHA and National Fire Protection Association (NFPA) specifications that cabinet contents be protected from temperatures exceeding 325 ^{o}F for at least 10 minutes, enough time for personnel to evacuate the area.
2. Quantities of flammables stored shall not exceed the manufacturer's specification for the cabinet.
3. Maximum Container Sizes: OSHA and NFPA limit the size of the container for classes of flammable and combustible materials. The more fire-resistant container, the larger it may be. Only certified containers will be used.

C. Safety Cans for Flammables

1. Approved portable safety containers shall be used for storing flammable liquids in quantities greater than 4 liters (1 gallon).

D. Compressed Gas Cylinders

1. Storage and Labeling
    a) The names of the compressed gases must be prominently posted.

b) Storage of flammable gases in laboratories is restricted to twice that which is necessary for the procedures.
c) If gases are manifolded or piped to or from equipment, the connections piping and/or tubing shall be compatible with the gases used (i.e. copper and acetylene are incompatible).
d) Cylinders of incompatible gases must be segregated by distance. Cylinder must be grouped by the type of gas (e.g. toxic, corrosive, etc.)
e) Empty cylinders should be separated from nonempty cylinders and labeled "empty" or "MT." Cylinders are considered empty if their pressure is less than 100 psig.
f) All compressed gasses must be stored away from direct or localized heat (including radiators, steam pipes, or boilers) in well-ventilated and dry areas and away from area where heavy items may strike them (e.g., near elevators or service corridors).
g) All compressed gases, including empty cylinders, must be secured in an upright position with chains, straps or specials stands or adequate strength and must be capped when stored or moved.

2. Transportation of Cylinders
   a) Compressed gas cylinders shall be transported with hand trucks only with the cylinder strapped in place.
   b) The hand trucks are preferably four-wheeled and are stable without the operator's assistance.
   c) Cylinders shall never be dragged or rolled.
3. Proper Handling of Gas Cylinders
   a) Always open cylinders valves slowly and never force the valve open.
   b) Never interchange regulators and hose in lines among different gases.
   c) Do not use cylinders without a regulator.
   d) Never attempt to refill a cylinder. Small helium cylinders may be refilled from larger cylinders with the proper connection supplied be the manufacturer.
   e) Never drop cylinders; never permit cylinders to strike each other or with a metal instrument.
   f) Inspect cylinders regularly for corrosion or leaks. In case of a leak, promptly remove the cylinder in compliance with the SDS and call the Campus Safety Coordinator for assistance.

E. Oxidizers

1. Oxidizers must be stored away from incompatible materials such as:
   a) Flammables and combustible materials
   b) Greases
   c) Paper trash binds
   d) Finely divided metals
   e) Organic liquids
2. Oxidizers, particularly nitric acid, sulfuric acid, and perchloric acid, shall be stored separately from organic acids in rooms, cabinets, or break-resistant containers and placed in acidic-resistant trays.

3. Strong oxidizing agents shall be stored and used in glass or other inert containers. Corks and rubber stoppers shall not be used. High energy oxidizers shall be segregated.
4. Peroxides and chemicals that tend to form peroxides must be stored in airtight containers in a dark, cool and dry place.
5. To minimize the rate of decomposition, peroxides and peroxidizable materials shall be stored at the lowest possible temperature consistent with their solubility and freezing point. Liquid peroxide or solutions shall not be stored at or below the temperature at which the peroxide freezes or precipitates, because peroxides in these forms are extremely sensitive to shock and heat.

F. Toxic Chemicals

1. Extremely toxic substances must be stored in unbreakable chemically resistant secondary containers.
2. Adequate ventilation must be provided in storage areas especially for toxic chemicals that have a high vapor pressure.
3. All dispensing of these materials must be conducted in a fume hood.

IX. Control Measures

A. Personal Protective Equipment

1. General
   a) Personal Protective Equipment (PPE) is used to prevent contact and exposure to hazardous materials.
   b) PPE includes, but is not limited to protective eyewear, gloves, respirators and clothing.
   c) The appropriate PPE is based on the level of hazard that may be encountered.
   d) Users must be trained in the proper use of PPE. If respiratory protection is required, medical clearance and fit testing are also required.
2. Eye Protection
   a) When an operation or activity has the potential of an eye injury from dust, liquids, impact, glare, or any other foreign object entering the eye.
   b) Eye protection includes safety glasses, goggles, and face shields. See the Appendix for guidance
3. Face Protection
   a) When an operation or activity has the potential of a face injury from flying objects, chemical splash, or injurious radiation. Eye protection must always be worn under face protection.
   b) Face protection include a full face shield that extends below the chin and around the side of the fact. See the Appendix for guidance.
4. Hand Protection and Gloves
   a) When an operation or activity has the potential to cut, burn, blister, or bruise the hands, especially when working with chemicals, high voltages, metal plates, or pipes.
   b) When working with equipment used for lifting or excavating, or working on high voltages that require rubber gloves.
   c) The type of gloves that is used depends of the nature of the hazard and how long it will be worn.

d) A guide of the use of gloves in the laboratory is given in the Appendix**.**

5. Respiratory Protection
    a) When an operation or activity has a potential of harmful concentrations of dusts, fumes, gases, vapors, or radionuclides being present in the work environment.
    b) Respiratory protection includes dust mask, cartridge mask, and full self-contained breathing apparatus.
    c) Respirator Selection and Use:
        (1) Selection of respirators and respirator accessories, fit testing and training must be coordinated through the CSC.
        (2) Any user who is required to wear a respirator must receive medical clearance, be fit tested and trained before using the respirator.
        (3) A respirator face piece is designed and selected for individual must never be worn before an evaluation has been made. Use of a respirator by an untrained individual, or in an application other than that for which it was designed, can prove extremely dangerous. In addition, a single respirator face piece cannot be designed to fit the entire working population.
6. Hearing Protection
    a) When working in an area designated as a hearing protection area and/or when working near equipment with a noise level of 85 dB or greater.
    b) Hearing protection includes ear plugs and headsets.
7. Hard Hats
    a) When working at or visiting construction sites, designated hard hat areas, or any other area where tools or objects may fall from above.
8. Safety Shoes
    a) When an operation or activity has the potential of a foot injury from falling and/or rolling objects, from piercing the sole, or from electrical hazards.
9. Safety Belts
    a) When working from an aerial lift, riding in a man-lift or working on any unguarded raised platform or roof.
10. Safety Harness
    a) When working in Confined Spaces or elevations higher than 6 feet in height.
11. Disposable Clothing
    a) When an operation or activity has the potential of an exposure to asbestos, PCB oil, pesticide spray, or any other containment.
12. Protective Clothing
    a) Whenever engaged in an activity or operation where the normal working attire will not afford suitable protection from injury.

B. Engineering Controls

1. Ventilation
    a) Ventilation is the most common and most important form of engineering control used to reduce the exposures to hazardous chemicals. There are two types of ventilation.

2. General Ventilation
    a) General ventilation for laboratory operations should be designed such that the laboratory is under a slightly negative pressure relative to other parts of the building. This prevents odors and vapors from leaving the lab.
    b) Lab ventilation should be 6 to 8 room air changes per hour. It should be noted that this rate will not necessarily prevent the accumulation of chemical vapors in "dead spots" or "eddies," which should be minimized during the design of the laboratory.
3. Local Exhaust Ventilation (Fume Hoods)
    a) Operations and reactions that product hazardous fumes, have a fire or explosion hazard, have the potential of a splash hazard or involve highly toxic materials should be performed in an approved fume hood.
    b) The ventilation flow rate must be at least 100 feet per minute (fpm), but no greater than 125 fpm with sash wide open.
    c) A hood that is more than 10% below standard in exhaust volume shall not be used unless its condition is labeled and the maximum sash opening marked clearly. All deficiencies with fume hood performance shall be reported to the Maintenance by the Faculty or the Department Safety Officer.

C. Equipment

1. General Use
    a) Use equipment only for its intended purpose
    b) Inspect equipment or laboratory apparatus for damage before use. Never use damaged equipment such as cracked glassware or equipment with frayed electrical wiring.
2. Fume Hood Use
    a) The user shall establish work practices that minimize emissions and employee exposure.
    b) The worker shall not lean into the hood so that his/her head is inside the plane of the hood face without adequate respiratory and personal protection, except for setup work or hood maintenance.
    c) Equipment in the hood shall not block airflow to slots in the baffle.
    d) The hood sash or panels shall not be removed except for setup work without hazardous chemicals in the hood.
    e) The hood sash or panels shall be closed to the maximum position possible while still allowing comfortable working conditions.
3. Glove Boxes
    a) Glove boxes and glove bags are isolation units used for handling highly toxic chemicals and carcinogens. These units are negative pressure, so air leakage is into the unit. The ventilation rate must be at least 2 volume changes per hour and pressure at least 0.5 inches of water.
    b) Some units are positive pressure, so there is the potential for leakage into the laboratory. Positive pressure units are used when protection from atmospheric moisture or oxygen is required. Never use toxic chemicals in a positive pressure unit.

c) These units must be regularly tested for leaks and must have a shut-off valve and pressure gauge installed.
d) Exhaust air is treated by scrubbing and/or absorption prior to release into the regular exhaust system.

4. Autoclave
   a) All biohazard materials are autoclaved for 15mintures at 15psi. This is enough to sterilize both organisms and viruses.
   b) All maintenance is performed by: Z.G.B. Instrumentation Repair Company, 4101 Tryon Road, Raleigh, North Carolina 27606.

D. Safety Equipment

1. General
   a) Access to emergency equipment, electrical panels, emergency shutoffs, (i.e. gas, water), fire extinguishers, utility controls, showers, eyewash stations, and laboratory exits must never be blocked. Three square feet is required around each.
   b) At a minimum, the following safety items must be readily available to all laboratories:
      (1) Fire Extinguishers
      (2) Eyewash/Safety Showers
      (3) First Aid Kits
      (4) Emergency Numbers Posted
      (5) Spill Kits/Absorbents
2. Safety Showers/Eyewashes Fountains
   a) Eyewash fountains must be plumbed into the building's water system so that it can generate a continuous stream of water.
   b) Low volume eyewash bottles are inadequate for any response to chemicals in the eye and should never be used.
   c) Safety showers and eyewashes will be tested on a regular basis by Department Safety Officer. Any problems should be promptly reported to the Maintenance.
3. Fire Extinguishers
   a) Each laboratory will have one or more carbon dioxide extinguishers.
   b) Fire extinguishers are tested regular by the CSC or the Department Safety Officer. Any problems should be promptly reported to the Maintenance.
   c) Dry powder extinguishes will be located at the ends of each hallway in Bridges and Smith Buildings as a secondary emergency fire response.
   d) Additional carbon dioxide extinguishers may be located in special areas such as the stockroom.
4. Spill Kits
   a) Kits on hand:
      (1) Acid kits
      (2) Base kits
      (3) Solvent kits
      (4) Mercury kits

E. Biological Safety Cabinets

1. Biological Safety Cabinet Requirements:

a) Class I or II cabinets shall be used for Biosafety Level 2 work if the aerosolization potential increases the risk of exposure and disease to unacceptable levels.
b) Class I or II cabinets must be used for Biosafety Level 3 work all manipulations of infectious materials.
c) Class III containment hoods must be used for all procedures and activities of Biosafety Level 4 work.

2. Certification
   a) Biological safety cabinets shall be used only after certification has been completed by a qualified outside contractor.
   b) Biological safety cabinets shall be recertified at least yearly, or as deemed necessary by the hazards involved.
   c) All biological safety cabinets must also be recertified if relocated, repaired or if HEPA filters are changed. If filters are to be changed, it will require formaldehyde decontamination of the cabinet. To facilitate this process, all vented Type I, II, and III cabinets must be installed with seal-tight dampers to prevent premature escape and contamination of the formaldehyde gas as it will require the complete shutdown of the fume hood exhaust system.

X. Waste Disposal

A. Laboratory Waste

1. A number of federal and state regulations govern the disposal of hazardous wastes. General guidance is given in this section. Consult with the CSC if there are any questions regarding waste disposal.
2. Training in waste collection and disposal is provided in the CSC
3. The University will contract with a waste disposal company for assistance in the collection, inventorying, and disposal of waste across the campus.
4. The specific details of the collection process, the amount of waste per container, the type of container, and the disposal process will be provided by the waste disposal company.
5. The generation of hazardous waste is to be minimized. Faculty and supervisors are encouraged to develop and use validated experimental procedures that replace hazardous materials with non-hazardous materials, minimize generation of hazardous wastes, or result in effective treatment of wastes to reduce or eliminate hazardous characteristics.
6. Laboratories and the storage areas should be reviewed annually for excess chemicals. If these chemicals cannot be used, they should be processed for disposal.
7. Liquid wastes are accumulated in appropriate containers and are processed for disposal at appropriate intervals.
8. Certain classes of chemical (flammable liquids, radioactives, health hazards) must be separated according to the guidelines provided by the waste disposal company.
9. All materials that pose a potential puncture hazard (e.g., hypodermic needles, broken glass, or plasticware) must be packaged in puncture resistant containers prior to removal from the work area.

10. Hazardous wastes must never be left in or on loading docks, elevators, lobbies, hallways or any other unrestricted locations.
11. All hazardous wastes must be identified before being offered for disposal. Waste of unknown or incorrectly described composition presents difficult handling and disposal problems and may require costly analysis before removal and disposal can be accomplished. The cost of the analysis and disposal is the responsibility of the Department or area generator.

B. Special Waste

1. Mercury, Thallium, Beryllium and Osmium pose special disposal problems in regards to other waste. If you are generating waste which contains any of these elements please contact the University Safety Committee before you begin.

2. Ethidium bromide usually does not need to be disposed of as hazardous waste.

a) Electrophoresis gels contained trace amounts of ethidium bromide (<0.1%) may be placed in regular laboratory trash.

3. Silica gel, molecular sieves and desiccants are not considered hazardous waste unless they are grossly contaminated.

C. Biohazard Waste

1. This CHSP does not address the use of biological materials or animals in laboratories. Preserved specimens used in labs are collected in plastic biohazard buckets/boxes and picked up for off-site disposal.

D. Sharps Waste

1. All sharps waste is placed in appropriate and approved sharps containers/boxes and picked up for off-site disposal.

E. Radioactive Waste

1. This CHSP does not address the use of radioactive materials and equipment in laboratories as Wingate University does not hold any active radiological use licenses**.**

XI. Emergency Procedures

A. Accidents and Incidents

1. All accidents which result in excessive exposure of a hazardous material to personnel are to be reported promptly to the Department Safety Officer.
2. Such reportable occurrences include accidental ingestion, inhalation, or inoculation of any hazardous material in a quantity that can reasonably be expected to produce deleterious effects.
3. All spills of significant quantities of hazardous materials (> 250 mL) should also be reported since they can easily lead to exposure of unwary personnel.
4. An Accident Report Form should be completed and file with the Department's Safety Records. The Accident Report Form should contain:
    a) Name, occupation and department of each exposed or involved person
    b) Name and location of the person investigating the incident
    c) Brief description of accident or incident [what happened; nature of exposure (ingestion, inhalation, inoculation, etc.).
    d) A description of the resolution of the accident and what has been done to aid the victim(s).

5. Accident Report Form will assist planning efforts to make the area a safer one in which to work. It will also serve an important legal purpose in the case of litigation resulting from the occurrence.

B. Serious Emergency without Fire or Hazardous Material Exposure

1. In the case of a serious emergency (life-threatening emergencies, falls, medical emergencies), call 911.
2. Rescue anyone immediately affected by the emergency if possible.
3. Evacuate the area and building if necessary.
4. Provide first aid and assistance until emergency responders arrive.
5. EMS would transport the injured to the hospital if necessary.

C. Fires

1. If the fire is small and contained:
    a) Evacuate the area
    b) Use the fire extinguisher in the laboratory to extinguish the fire.
    c) Make sure that volatile vapors and heat sources are controlled to prevent re-ignition of the fire.
    d) Clean up the extinguishing material and the area.
    e) Dispose of the cleanup material in hazardous waste.
    f) Ventilate before resuming operations.
    g) If the fire cannot be extinguished quickly or is too large
    h) Evacuate the area
    i) Activate the fire alarm
    j) Call 911
    k) Evacuate the building

D. Hazardous Spills

1. General Guidelines
    a) Immediately alert others in the area as soon as any spill occurs.
    b) The quantities of material that might be released must be determined.
    c) Location and contents of spill kits that should be made available where possible.
    d) If there is no fire hazard and the material is not particularly volatile or toxic, clean it up as soon as possible with the appropriate materials and procedures.
    e) If a volatile, flammable, or toxic material is spilled, immediately warn everyone to extinguish flames and turn off spark-producing equipment and heat sources.
    f) Pick up any broken glass with tongs, dust pan, or some other mechanical device. Do not use your hands.
2. Small Chemical Spills with No Personal Exposure
    a) The guideline for this policy is 250 milliliters (mL) or less.
    b) These spills can be cleaned up by trained laboratory personnel.
    c) Clear the area.
    d) Contact the Department Safety Officer
    e) Consult the SDS for spill control procedures specific to the chemical.
    f) Use appropriate PPE and cleanup material/procedures.

g) Clean up the spill and place the spill cleanup items into a labeled hazardous waste container.

3. Small Chemical Spills with Personal Exposure
    a) For small spills with exposure, begin washing the exposed area with water.
    b) If the exposed area is small, the sink faucet may be used.
    c) If the exposed area is large, use the safety showers. Wash for at least 15 min
    d) If the eye is exposed, use the eyewash fountain. Wash for at least 15 minutes.
    e) Clear the area.
    f) Contact the Department Safety Officer who will contact the CSC and emergency personnel.
    g) After the exposure is mitigated, the cleanup may begin.
    h) Use appropriate PPE and cleanup material/procedures.
    i) Clean up the spill and place the spill cleanup items into a labeled hazardous waste container.
4. Large Chemical spill with No Personal Exposure
    a) Clear the area.
    b) Contact the Department Safety Officer.
    c) If sufficient cleanup materials are available, the Department Safety Officer can begin directing the cleanup.
    d) If the spill is too large or too hazardous, the Department Safety Officer will contact the Campus Safety Coordinator and 911.
    e) Clear the building and wait for help to arrive.
5. Large Chemical spill with Personal Exposure
    a) Clear the area.
    b) Move the exposed person to a clean lab and administer first aid including safety shower if necessary. Eye exposure should be washed immediately in the incident lab if conditions are favorable.
    c) Contact the Department Safety Officer.
    d) If sufficient cleanup materials are available, the Department Safety Officer can begin directing the cleanup.
    e) If the spill is too large or too hazardous, the Department Safety Officer will contact the Campus Safety Coordinator and 911.
    f) Clear the building and wait for help to arrive.

E. Biohazard Spills in the Laboratory

1. Employee Contamination
    a) If the skin becomes contaminated with blood or other potentially infectious materials, wash the area thoroughly with soap and water.
    b) If blood or other potentially infectious material is splashed into the eyes, immediately use the eyewash station, and flush for at least 15 minutes. Contact Human Resources for exposure control form.
    c) Remove grossly contaminated clothing immediately. Place the contaminated clothing in a plastic bag. Bag must be labeled with hazard (i.e. Biohazard).

d) Report the spill to the Supervisor, and seek medical attention.

2. Clean-Up
    a) Wear the appropriate personal protective equipment (PPE) to clean up the spill.
    b) Place absorbent towels over the spill, making sure not to spread the liquid.
    c) Carefully pour a dilute bleach solution (1:10) or other EPA registered tuberculocidal agent over the absorbent towels. Let this remain for 20 minutes in order to disinfect the spill.
    d) Carefully pick up the absorbent towels, and place into a plastic bag. Wash the contaminated area again with the bleach, unless incompatible with spilled material, or other disinfectant. Rinse the area with water.
    e) All PPE, towels, and other items that became contaminated must be disposed of as regulated medical waste.
    f) Wash hands and any other exposed skin with soap and water before leaving the work area.
3. Spills in a Biological Safety Cabinet or Laminar Flow Hood
    a) Do not shut off the ventilation. The cabinet shall be left running to prevent the escape of contaminants. If there is a UV light, leave it on.
    b) Wear the appropriate PPE. If the material is infectious, a respirator may be needed. Contact the CSC for additional information.
    c) Use a diluted bleach solution (1:10) or an EPA registered tuberculocidal agent to disinfect the cabinet. Wipe the walls, work surfaces, and equipment with the disinfectant. Use sufficient amount of the disinfectant to ensure that the drain pans and catch basins below the work surface get disinfected. Lift the front exhaust grill and tray and wipe all surfaces. Let the disinfectant stand for 10 minutes. Wipe the catch basin and drain the disinfectant into a container. Wipe the area with water.
    d) This procedure will not disinfect the filters, blowers, air ducts, or other interior parts of the cabinet. If the cabinet is to be sterilized, contact the CSC for additional information.

Appendix A. Locations of the Chemical Hygiene Plan

Building – Room	Area
Smith 230	Chemistry Department Office
Smith 234	Science Department Office
Smith 2nd Floor	Safety Cabinet
Goodman Service Center	Asst. VP for Business Operations
Stegall 2nd Floor	VP for Academic Affairs
Stegall 3rd Floor	VP for Business Affairs

Appendix B. Glossary and Abbreviations

Acute - Severe, often dangerous, conditions in which relatively rapid changes occur.

Acute Health Hazards - effects that occur immediately or soon after contact.

Aerosol- Liquid droplets or solid particles dispersed in air that are of fine enough size (less than 100 micrometers) to remain dispersed for a period of time.

Asphyxiant- A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.

Boiling point- The temperature at which the vapor pressure of a liquid equals atmospheric pressure or at which the liquid changes to a vapor. If a flammable material has a low boiling point, it indicates a special fire hazard.

Campus Safety and Chemical Hygiene Coordinator (CSCHC) - An employee who is designated by the employer provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene and Safety Plan.

Cancer - A malignant tumor characterized by proliferation (rapid growth) of abnormal cells.

Carcinogen - A cancer-producing substance or physical agent in animals or humans. A chemical is considered a **carcinogen** or **potential carcinogen** if it is so identified in any of the following:

- National Toxicology Program, "Annual Report of Carcinogens" (latest edition)
- International Agency for Research on Cancer, "Monographs" (latest edition)
- OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances

Chemical - Any element, molecule, compound, or mixture of elements and/or compounds.

Chemical Hygiene and Safety Plan (CHSP) - A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that (1) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (2) meets the requirements of OSHA regulation 29 CFR 1910.1450.

Chemical Manufacturer - An employer in SIC Codes 20 through 39 with a workplace where chemicals are produced for user or distribution.

Chemical Reaction- A change in the arrangement of atoms or molecules to yield substances of different composition and properties. (See Reactivity)

Chronic - Persistent, prolonged or repeated conditions.

Chronic Health Hazards – health effects that appear after prolonged or repeated exposures over many days, months, or years.

Code of Federal Regulations (CFR) - is the codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the federal government of the United Sates.

Combustible Liquid - Any liquid having a flashpoint at or above 100^{o}F (37.8^{o}C) but below 200^{o}F (93.3^{o}C) except any mixture having components with flashpoints of 200^{o}F or higher, the total volume of which make up 99% or more of the total volume of the mixture.

Common Name - Any designation or identification, such as code name, code number, trade name, brand name, or generic name used to identify a chemical other than by its chemical name.

Compressed Gas-- A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C), or; a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C), or; a liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

Container- Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purpose of this document, pipes or piping systems are not considered to be containers.

Corrosive - A substance that, according to the DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact or is highly corrosive to steel.

Designated Area- An area which has been established and posted with signage for work involving hazards, e.g. "select carcinogens," reproductive toxins, or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory, or a device such as a laboratory hood.

Employee- An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments. The term "employee" includes students, visiting professors and scholars, trainees, and other individuals who are subject to the same exposures or working conditions as employees.

Employer- The employer, for purposes of this document, means Wingate University.

Environmental Protection Agency (EPA) - U.S. Environmental Protection Agency; federal agency with environmental protection regulatory and enforcement authority. Administers Clean Air Act, Clean Water Act, FIFRA, RCRA, TSCA, and other Federal Environmental Laws.

Evaporation Rate- The rate at which a material is converted to vapor (evaporates) at a given temperature and pressure. Health and fire hazard evaluations of materials involve consideration of evaporation rates as one aspect of the evaluation.

Exhaust Ventilation- A ventilation system that captures and removes the contaminants at the point they are being produced before they escape into the workroom air. The system consists of hoods, ductwork, a fan, and possibly an air-cleaning device. Advantages of local exhaust ventilation over general ventilation include: it removes the contaminant rather than dilutes it, requires less airflow and, thus, is more economical over the long term; and the system can be used to conserve or reclaim valuable materials; however, the system must be properly designed with the correctly shaped and placed hoods, and correctly sized fans and ductwork.

Explosive- A chemical that causes a sudden, almost instantaneous release of gas and heat and generates a pressure wave when subjected to a sudden shock, pressure, or high temperature.

Exposure/Exposed- An employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, injection or absorption), and includes potential exposure (i.e. accidental or possible).

Flammable- A chemical that falls into one of the following categories (Refer to Appendix?) :

i) **flammable aerosol** - an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening.

ii) **flammable gas** - a gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13% by volume or less; or a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.

iii) **flammable liquid** - any liquid having a flashpoint below 100 ^{o}F (37.8 ^{o}C), except any mixture having components with flashpoints of 100 ^{o}F (37.8 ^{o}C) or higher, the total of which make up 99% or more of the total volume of the mixture.

iv) **flammable solid** - a solid, other than a blasting agent or explosive as defined in 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a greater than one-tenth of an inch per second along its major axis.

Formula - The scientific designation for a material (water is H_2O; sulfuric acid is H_2SO_4; sulfur dioxide is SO_2 etc.)

Fume - Small solid particles that have condensed in the air resulting from the heating of a solid body. Gases and vapors are not fumes, although the terms are often mistakenly used interchangeably.

Gas - A form of matter that is neither solid nor liquid. In its normal state (at room temperature and atmospheric pressure) it can expand indefinitely to fill a container completely. A gas can be changed to the liquid or solid state under the right temperature and pressure conditions.

General Ventilation - Also known as general exhaust ventilation, this is a system of ventilation consisting of either natural or mechanically induced fresh air movements to mix with and dilute contaminants in the workroom air. This is not the recommended type of ventilation to control contaminants that are highly toxic, when there may be corrosion problems from the contaminant, when the worker is close to where the contaminant is being generated, and where fire or explosion hazards are generated close to sources of ignition.

Hazard Warning - Any words, pictures, symbols or combination thereof appearing on a label or other appropriate form of warning which convey the hazards of the chemical(s) in the container(s).

Hazardous Material- Any material which is a potential/actual physical or health hazard to humans. A substance or material capable of posing an unreasonable risk to health, safety, and property when transported including, but not limited to, compressed gas, combustible liquid, corrosive material, cryogenic liquid, flammable solid, irritating material, material poisonous by inhalation, magnetic material, organic peroxide, oxidizer, poisonous material, pyrophoric liquid, radioactive material, spontaneously combustible material, an water-reactive material.

Hazardous Chemical- A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the

hematopoietic system, and agents which damage the lungs, skin, eyes or mucous membranes. A chemical is considered **hazardous** if it is listed in any of the following:

- OSHA, 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances
- "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment," ACGIH (latest edition)
- "The Registry of Toxic Effects of Chemical Substances," NIOSH (latest edition)

High Efficiency Particulate Air (HEPA)- is a type of filter that must remove 99.7% if particles that pass through it and have a size if 0.3 micrometers or larger.

Incompatible - The term applies to two substances to indicate that one material cannot be mixed **with the other without the possibility of a dangerous reaction.**

Ingestion- Taking a substance into the body through the mouth as food, drink, medicine, or unknowingly as on contaminated hands or cigarettes, etc.

Inhalation - The breathing in of an airborne substance that may be in the form of gases, fume mists, vapors, dusts, or aerosols.

Irritant - A substance which, by contact in sufficient concentration for a sufficient period of time, will cause an inflammatory response or reaction of the eye, skin, nose or respiratory system. The contact may be a single exposure or multiple exposures. Some primary irritants: chromic acid, nitric acid, sodium hydroxide, calcium chloride, amines, metallic salts, chlorinated hydrocarbons, ketones and alcohols.

Label - Any written, printed or graphic material displayed on or affixed to containers of chemicals, both hazardous and non-hazardous.

Laboratory - A facility where the "laboratory use of chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Lethal Concentration 50% (LC_{50}) - The concentration of an air contaminant that will kill 50% of the test animals in a group during a single exposure.

Lethal Dose 50% - (LD_{50})- The dose of a substance or chemical that will kill 50% of the test animals in a group within the first 30 days following exposure.

Lower Explosive Limit (LEL) - The lowest concentration of a substance that will produce a fire or flash when an ignition source (flame, spark, etc.) is present. It is expressed in a percent of vapor or gas in the air by volume. Below the LEL or LFL, the air/contaminant mixture is theoretically too "lean" to burn. (See also UEL)

Melting Point- The temperature at which a solid changes to a liquid. A melting range may be given for mixtures.

Mixture - Any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

Mutagen - Anything that can cause a change (or mutation) in the genetic material of a living cell.

National Fire Protection Association (NFPA)- a voluntary membership organization whose aims are to promote and improve fire protection and prevention. NFPA has published 16 volumes of codes known as the National Fire Codes. Within these codes is Standard No. 705, "Identification of the Fire Hazards of Materials". This is a system that rates the hazard of a material during a fire. These hazards are divided into health, flammability, and reactivity hazards and appear in a well-known diamond system using from zero through four to indicate severity of the hazard. Zero indicates no special hazard and four indicates severe hazard.

Occupational Safety and Health Administration (OSHA) - The Occupational Safety and Health Administration; a federal agency under the Department of Labor that publishes and enforces safety and health regulations for most businesses and industries in the United States.

Odor Threshold - The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.

Organic Peroxide - An organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer- Is a substance that gives up oxygen easily to stimulate combustion of organic material.

Permissible Exposure Limit (PEL) - An exposure, inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, subpart Z. PELs may be either a time-weighted average (TWA) exposure limit (8-hour), a 15-minute short-term limit (STEL). The PELs are found in OSHA regulations part 1910, subpart Z. (See also TLV)

Personal Protective Equipment (PPE) - Any devices or clothing worn by the worker to protect against hazards in the environment. Examples are respirators, gloves, and chemical splash goggles

Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.

Polymerization - A chemical reaction in which two or more small molecules combine to form larger molecules that contain repeating structural units of the original molecules. A hazardous polymerization is the above reaction with an uncontrolled release of energy.

Pyrophoric - A chemical that will spontaneously ignite in the air at a temperature of 130 ^{o}F (54.4 ^{o}C) or below.

Reactivity - A substance's susceptibility to undergoing a chemical reaction or change that may result in dangerous side effects, such as explosion, burning, and corrosive or toxic emissions. The conditions that cause the reaction, such as heat, other chemicals, and dropping, will usually be specified as "Conditions to Avoid" when a chemical's reactivity is discussed on an MSDS.

Resource Conservation and Recovery Act (RCRA)- is an act to protect human health and the environment form the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generates, and to ensure that wastes are managed in an environmentally sound manner. They regulate the management of solid waste, hazardous waste, and underground storage tanks holding petroleum products or certain chemicals.

Reproduce Toxins - Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Respirator- A device which is designed to protect the wearer from inhaling harmful contaminants.

Respiratory Hazard - A particular concentration of an airborne contaminant that, when it enters the body by way of the respiratory system or by being breathed into the lungs, results in some body function impairment.

Safety Data Sheet (SDS) - Written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of 29 CFR 1910.1200.

Sensitizer- A substance that may cause no reaction in a person during initial exposures, but afterwards, further exposures will cause an allergic response to the substance.

Short-Term Exposure Limit (STEL) - Represented as STEL or TLV-STEL, this is the maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures. Also the daily TLV-TWA must not be exceeded.

Solvent - A substance, commonly water, but in industry often an organic compound, which dissolves another substance.

Substance - A chemical element or compound; can also refer to a mixture.

Synonym - Another name by which the same chemical may be known or an abbreviation.

Teratogen - An agent or substance that may cause physical defects in the developing embryo or fetus when a pregnant female is exposed to that substance.

Threshold Limit Value (TLV) - Airborne concentration of substances devised by the ACGIH that represents conditions under which it is believed that nearly all workers may be exposed day after day with no adverse effect. TLVs are advisory exposure guidelines, not legal standards, that are based on evidence from industrial experience, animal studies, or human studies when they exist. There are three different types of TLVs: Time-Weighted Average (TLV-TWA) and Short-Term Exposure Limit (TLV-STEL). (See also PEL).

Toxicity - A relative property of a material to exert a poisonous effect on humans or animals and a description of the effect and the conditions or concentration under which the effect takes place.

Trade Name- The commercial name or trademark by which a chemical is known. One chemical may have a variety of trade names depending upon the manufacturers or distributors involved.

Unstable (Reactive) - A chemical which, in the pure state or as a produced or transported, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shock, pressure, or temperature.

Upper Explosive Limit (UEL) (Also known as upper flammable limit) - The highest concentration (expressed in percent of vapor or gas in the air by volume) of a substance that will burn or explode when an ignition source is present. Theoretically, above this limit the mixture is said to be too "rich" to support combustion. The difference between the LEL and the UEL constitutes the flammable range or explosive range of a substance. That is, if the LEL is 1 ppm and the UEL is 5 ppm, then the explosive range of the chemical is 1 ppm to 5 ppm. (Also see LEL)

Vapor - The gaseous form of substances which are normally in the liquid or solid state (at normal room temperature and pressure). Vapors evaporate into the air from liquids such as solvents. Solvents with lower boiling points will evaporate faster.

Water-Reactive - A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Appendix C. Hazardous Material Classes

Class 1. Explosives- Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, that is, with substantially instantaneous release of gas and heat. The Use of these materials requires special procedures and facilities and therefore must be approved by the CHSO.

1) Class 1.1 Mass explosive hazard
   a) Detonation by spark, flame, or shock
   b) Mass explosion
   c) Such as nitroglycerine, PbN_3, black powder
2) Class 1.2 Projectile hazard
   a) With a rapid combustion
   b) Such as photo flash powder
3) Class 1.3 Fire and minor blast or projectile hazard
   a) Such as flares, small arms ammo, fireworks
4) Class 1.4 Minor (isolated) explosive hazard
   a) Even with external fire
5) Class 1.5 Mass explosive but insensitive to detonation
   a) Such as blasting agents
6) Class 1.6 Extremely insensitive to detonation
   a) With no mass explosive

Class 2. Compressed Gases- A gas or liquid with a Boiling Point $\leq 20\ ^{o}C$, a Vapor Pressure > 40 psi @ $70\ ^{o}F$ or >104 psi @ $130\ ^{o}F$, or a flammable liquid with a Vapor Pressure > 40 psi @ $100\ ^{o}F$.

1) Class 2.1 Flammable Gases Lower Explosion Limit $\leq 12\%$
   a) Flammability Range $\geq 12\%$
   b) Such as H_2, C_2H_2, CH_4
2) Class 2.2 Non-Flammable Gases
   a) Vapor Pressure ≥ 40.6 psi
   b) Liquefied gas or Cryogenic gas
   c) Such as CO_2, He, N_2
3) Class 2.3 Poisonous Gases
   a) By inhalation
   b) $LC_{50} \leq 5000 mL/m^3$
   c) Such as HCN, cyanogen, phosphine, F_2

Class 3. Flammable Liquid: A liquid having a flash point less than $100\ ^{o}F$ or $38.7\ ^{o}C$ with a vapor pressure less than 40 psi at $100\ ^{o}F$ is designated a Class I liquid with subclasses as follows:

1) **Class IA** - A liquid having a flash point less than $73\ ^{o}F$ ($22.8\ ^{o}C$) and having a boiling point less than $100\ ^{o}F$ ($38.7\ ^{o}C$).
2) **Class IB** - A liquid having a flash point less than $73\ ^{o}F$ ($22.8\ ^{o}C$) and with a boiling point equal to or greater than $100\ ^{o}F$ ($38.7\ ^{o}C$)
3) **Class IC** - A liquid having a flash equal to or greater than $73\ ^{o}F$ ($22.8\ ^{o}C$) and less than $100\ ^{o}F$ ($38.7\ ^{o}C$)

Combustible Liquid: A liquid that does not meet the definition of any other hazard class and possesses a flashpoint greater than 100 ^{o}F (38.7 ^{o}C) and less than 200 ^{o}F (93.4 ^{o}C) such as fuel oil, turpentine

1) **Class II:** a liquid having a flash point equal to or greater than 100 ^{o}F (38.7 ^{o}C) and less than 140 ^{o}F (60 ^{o}C).
2) **Class IIIA:** a liquid having a flash point equal to or greater than 140 ^{o}F (60 ^{o}C) and less than 200 ^{o}F (93.4 ^{o}C).
3) **Class IIIB:** a liquid having a flash point equal to or greater than 200 ^{o}F (93.4 ^{o}C).

Class 4. Flammable Solid

1) Class 4.1 Flammable Solid
   a) wetted explosive (Desensitized)
   b) thermally unstable self-reactive material
   c) readily combustible solid, Burning rate $\geq$ 2.2 mm/s
   d) Such as charcoal, red phosphorus
2) Class 4.2 Spontaneously Combustible
   a) pyrophoric material that ignites in $\leq$ 5 min. in air
   b) self-heating material on contact with air
   c) Such as white phosphorus
3) Class 4.3 Dangerous When Wet
   a) spontaneously flammable on contact with water
   b) releases flammable or toxic gas or vapor on contact with water
   c) Such as Na, LiH, CaC_2

Class 5. Oxidizing Material

1) Class 5.1 Oxidizers
   a) Material that can cause or enhance the combustion of other materials
   b) Generally yields oxygen on reaction
   c) Such as CaOCl, NH_4NO_3, KNO_3
2) Class 5.2 Organic peroxides
   a) An organic compound that contains the R–O–O–R structure
   b) Such as benzyl peroxide, acetyl peroxide

Class 6. Poisons

1) Class 6.1 Poisonous material
   a) Very dangerous in small amounts
   b) Dangerous by external contact or ingestion
   c) Liquid: Oral $LD_{50} \leq$ 500mg/kg; Solid: Oral $LD_{50} \leq$ 200mg/kg
   d) Such as HNO_3, malathion, NaCl, Pb & As salts
2) Class 6.2 Infectious material
   a) Etiologic material: infectious or disease causing
   b) Viable microorganism or its toxin that causes disease
3) Class 6.3 Poisonous Gas
   a) Poisonous by inhalation
   b) $LC_{50} \leq 5000mL/m^3$
   c) Such as HCN, cyanogen, phosphine, F_2

IRRITANT

   d) dangerous or irritating fumes
   e) Such as tear gas, chloroacetophenone

Class 7. Radioactive Material - spontaneously emits ionizing radiation having a specific activity greater than 70 becquerels per gram (dps/g). (SA = surface activity)

1) Class 7.I : SA ≤ 0.005mSv/hr
2) Class 7.II : 0.005 < SA ≤ 0.50 mSv/hr
3) Class 7.III: SA > 0.50 mSv/hr

Class 8. Corrosive Material - liquid or solid capable of destruction of skin

1) pH ≤ 2 or pH ≥ 12.5
2) severe corrosion rate on steel or aluminum (≥ 0.25 in/yr)
3) acids, bases

Class 9. Miscellaneous- any other material that presents a hazard

1) Includes anesthetic, noxious or similar property, as well as elevated-temperature materials, hazardous substances, hazardous wastes, and marine pollutants
2) dry ice, iodine

ORM-D: Other Regulated Material - Class D

1) commercial consumer products such as hair spray

ORM-E: Other Regulated Material - Class E

1) material not covered in other classes
2) Hazardous waste that is not listed in other classes.

Appendix D. Hazard Communication: Safety Data Sheets and Chemical Labels

The Safety Data Sheet (SDS) -The following 16 sections are required on the SDS, in order listed, with the stated minimum required information for each section as listed. If no relevant information is found for any given subheading, the SDS must clearly indicate no applicable information is available. Sections 12 through 15 are regulated by other agencies therefore OSHA does not require them on the SDS as these sections fall outside of their jurisdiction.

	Heading	Subheading
1.	**Identification**	Product Identifier used on the label Other means of Identification; Recommended use of the chemical and restrictions on use; Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party; Emergency phone number.
2.	**Hazard(s) Identification**	Hazard Classification of the chemical such as skin corrosion/irritation, serious eye damage, eye irritation **Signal Word** to alert employees of a potential hazard. Two words are used: **Danger** for severe hazards and **Warning** for less severe hazards; **Hazard Statement(s)** describing the nature and degree of the hazard; **Symbol(s)** which may be graphical in nature or the name of the symbol, e.g. Flame, Skull & Crossbones; and **Precautionary Statement(s)** which recommends the measures taken to minimize or prevent adverse effects resulting from exposure or improper storage or handling. Describe any hazard not otherwise classified that has been identified during the classification process e.g. combustible dust or dust explosion hazard. Where an ingredient with unknown acute toxicity is used in a mixture at a concentration $\geq$ 1% and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consist of ingredient(s) of unknown acute toxicity is required.
3.	**Composition/ Information on Ingredients**	ludes information on chemical ingredients; trade secret claims · **Substances:** Chemical Name; Common Name and synonyms; CAS number and other unique identifiers; Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the substance. · **Mixtures-** In addition to the information required for substances: The Chemical name and concentration (exact percentage)

		or concentration ranges of all ingredients which are classified as health hazards and Are present above their cut-off/concentration limits. Present a health risk below the cut-off/concentration limits. The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance when there is batch-to batch variability in the production of a mixture or for a group of substantially similar mixtures with similar chemical composition. In these cases, concentration ranges may be used. • **All Chemicals where Trade Secret is Claimed:** Where a trade secret is claimed, a statement the specific chemical identify and/or percentage of composition has been withheld as a trade secret is required.
4.	**rst-aid Measures**	Description of necessary measures, subdivided according to the different routes of exposure (i.e., inhalations, skin, and eye contact, and ingestion) Most important symptoms/effects, acute and delayed; Indication of immediate medical attention and special treatment needed.
5.	**Fire-Fighting Measures**	Suitable (and unsuitable) extinguishing media. Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products) Special protective equipment and precautions for fire-fighters.
6.	**cidental Release Measures**	Personal precautions, protective equipment, and emergency procedures. Methods and materials for containment and cleaning up.
7.	**Handling and Storage**	Precautions for safe handling. Conditions for safe storage, including any incompatibilities.
8.	**Exposure Controls/Personal Protection**	OSHA permissible exposure (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available. Appropriate engineering controls. Individual protection measures, such as personal protective equipment.
9.	**Physical and Chemical Properties**	Appearance (physical state, color, etc.) Odor Odor Threshold pH melting point/freezing point Initial boiling point and boiling range Flash point Evaporation rate

		Flammability (solid, gas) Upper/lower flammability or explosive limits Vapor Pressure Vapor density Relative density Solubility (ies) Partition coefficient: n-octanol/water Auto-ignition temperature Decomposition temperature Viscosity
10.	**Stability and Reactivity**	Reactivity Chemical stability Possibility of hazardous reactions Conditions to avoid (e.g., static, discharge, shock, or vibration) Incompatible materials Hazardous decomposition products
11.	**Toxicological Information**	scription of the various toxicological (health) effects and the available data used to identify those effects, including: Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact) Symptoms related to the physical, chemical and toxicological characteristics Delayed and immediate effects and also chronic effects from short-and long-term exposure Numerical measures of toxicity (such as acute toxicity estimates) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs, or by OSHA.
12.	**Ecological Information (Non-Mandatory)**	Ecotoxicity (aquatic and terrestrial, where available) Persistence and degradability Bioaccumulative potential Mobility in soil Other adverse effects (such as hazardous to the ozone layer)
13.	**Disposal Considerations (Non-Mandatory)**	Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.
14.	**Transportation Information (Non-Mandatory)**	UN number UN proper shipping name Transport hazard class(es) Packing group, if applicable Environmental hazards (e.g., Marine pollutant (Yes/No))

		Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code) Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.
15.	**Regulatory Information (Non-Mandatory)**	ety, health and environmental regulations specific for the product in question.
16.	**her Information, Including Date of Preparation or Last Revision**	date of preparation of the SDS or the last change to it.

Appendix E-I. Chemical Compatibility Chart

Incompatible Chemicals

Certain chemicals should not be stored (and cannot be easily/safely mixed) with certain other chemicals due to severe exothermicity of reaction or uncontrolled production of a toxic product. In the event of earth tremor or other unexpected breakage, especially during fire, the consequences of proximal storage of incompatible materials can be fatal to staff, fire fighters, and other emergency responders. The following list contains examples of incompatibilities. **The list should not be considered complete**. For complete information about a specific chemical, always consult at least one current Material Safety Data Sheet.

Acetic acid	aldehyde, bases, carbonates, hydroxides, metals, oxidizers, peroxides, phosphates, xylene, chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Concentrated nitric and sulfuric acid mixtures, acids, amines, oxidizers, plastics
Acetylene	Chlorine, Bromine, Fluorine, halogens, mercury, potassium, oxidizers, silver, copper
Alkali/alkaline earth metals	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens, aldehydes, ketones, sulfur, plastics, acids
Ammonia (anhydrous)	Mercury (e.g. in Manometers), Chlorine calcium hypochlorite, hydrofluoric acid, Iodine, Bromine, acids, aldehydes, amides, halogens, heavy metals, oxidizers, plastics, sulfur
Ammonium nitrate	acids, alkalis, chloride salts, flammable & combustible materials, metals, nitrates, organic materials, phosphorous, powdered metals, reducing agents, urea, chlorates, sulfur
Aniline	acids, aluminum, dibenzoyl peroxide, oxidizers, plastics,
Arsenical materials	Any reducing agent
Azides	acids, heavy metals, oxidizers
Bromine	acetaldehyde, alcohols, alkalis, ammonia, amines, benzene, butane, petroleum gases, combustible materials, ethylene, fluorine, hydrogen, ketones (acetone, carbonyls, etc.), metals, methane, propane, sodium carbide, sulfur, turpentine, finely divided metals
Calcium oxide	water, acids, ethanol, fluorine, organic materials
Carbon (activated)	alkali metals, calcium hypochlorite, halogens, oxidizers
Carbon tetrachloride	Sodium
Chlorates	finely divided organic or combustible materials ammonium salts, acids, powdered metals, sulfur
Chlorine	acetylene, alcohols, ammonia, benzene, butadiene, butane, combustible materials, ethylene, flammable compounds (hydrazine), hydrocarbons (acetylene, hydrogen, hydrogen peroxide, iodine, metals, methane, nitrogen, oxygen, propane (or other petroleum

	gases), sodium carbide, sodium hydroxide, turpentine, finely divided metals
Chlorine dioxide	hydrogen, mercury, organic materials, phosphorus, potassium hydroxide, sulfur, methane, phosphine, ammonia, methane, phosphine, hydrogen sulfide
Chromic acid, chromic oxide.	acetone, alcohols, alkalis, ammonia, bases, acetic acid, naphthalene, camphor, glycerin, flammable liquids in general, naphthalene, camphor, glycerol, benzene, hydrocarbons, metals, organic materials, phosphorus, plastics
Copper	calcium, hydrocarbons, oxidizers, acetylene, hydrogen peroxide
Cumene hydroperoxide	acids (organic or inorganic)
Cyanides	acids, alkaloids, aluminum, iodine, oxidizers, strong bases
Flammable liquids	ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens, oxygen, oxidizers in general
Fluorine	All other chemicals
Hydrocarbons (liq and gas)	Flourine, Chlorine, Bromine, Chromic Acid, Sodium peroxide
Hydrocyanic acid	nitric acid, alkali
Hydrofluoric acid (anhydrous)	metals, organic materials, plastics, silica (glass, including fiberglass), sodium, ammonia (aqueous or anhydrous)
Hydrogen peroxide	all organics, alcohols, acetone, aniline, combustible materials, copper, chromium, iron, nitric acid, nitromethane, organic materials, phosphorous, sulfuric acid, sodium, most metals or their salts
Hydrogen sulfide	acetylaldehyde, metals, oxidizers, sodium, fuming nitric acid
Hydroperoxide	reducing agents
Hypochlorites	acids, activated carbon
Iodine	acetylaldehyde, acetylene, ammonia, metals, sodium, hydrogen
Mercury	acetylene, aluminum, amines, ammonia, calcium, fulminic acid, lithium, oxidizers, sodium
Nitric acid	acids, nitrites, metals, sulfur, sulfuric acid , most organics, plastics, sodium
Nitrites	acids
Nitroparaffins	inorganic bases, amines
Oxalic acid	oxidizers, silver, mercury, sodium chlorite
Oxygen	all flammable & combustible materials, oil, grease, ammonia, carbon monoxide, metals, phosphorous, polymers
Perchloric acid	all organics, wood, paper, oil, grease, dehydrating agents, hydrogen halides, iodides, bismuth and alloys
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	oxygen, air, alkalis, reducing agents

Potassium chlorate	acids, ammonia, combustible materials, fluorine, hydrocarbons, metals, organic materials, sugars, reducing agents
Potassium perchlorate	alcohols, combustible materials, fluorine, hydrazine, metals, organic matter, reducing agents, sulfuric acid
Potassium permanganate	benzaldehyde, ethylene glycol, glycerol, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartartic acid, ammonium compounds, fulminic acid, ozonides, peroxyformic acid
Sodium	Carbon tetrachloride, carbon dioxide, water, acids, hydrazine, metals, oxidizers
Sodium nitrate	acetic anhydride, acids, metals, organic matter, peroxyformic acid, reducing agents
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural, benzene, hydrogen sulfide metals, oxidizers, peroxyformic acid, phosphorous, reducing agents, sugars, water
Sulfides	acids
Sulfuric acid	alcohols, bases, chlorates, perchlorates, permanganates of potassium, lithium, sodium, magnesium, calcium
Tellurides	Reducing agents

Reference: Guide for Safety in the Chemical Laboratory, 2nd ed., Manufacturing Chemists' Association, Van Nostrand Reinhold: New York, 1972, pp. 215-217, Safety in Academic Chemistry Laboratories, ACS 7th ed. 2003, and various MSDSs and chemical container labels.

Appendix E- II. Definition of Reactive Chemicals

Any chemical which fits any one of the following:

1. Identified or described in the MSDS or on the label as unstable or reactive.
2. Ranked by the NFPA as 3 or 4 for reactivity.
3. Determined by the U. S. DOT (49 CFR 173) as an oxidizer, an organic peroxide, or an explosive.
4. Determined by the U.S. EPA (40 CFR 261.23) as reactive:
5. It is normally unstable and readily undergoes violent change without detonating.
6. It reacts violently with water.
7. It forms potentially explosive mixtures with water.
8. When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
9. It is a cyanide or sulfide material which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
10. It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
11. It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
12. Meets the OSHA Laboratory Standard Definition of an Unstable - a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self reactive under conditions of shocks, pressure or temperature.
13. In the experience of the Faculty or CSC is known or found to be reactive with ordinary substances

Appendix E- III. Definition of Low, Medium, and High Hazards

1. **Low Hazard Operations**
   a. Low hazard operations include work with chemicals that are relatively harmless to slightly toxic, have no potential for uncontrolled process hazards, and workers have previous experience with the type of work.
2. **Medium Hazard Operations**
   a. Medium hazard operations include work with chemicals that are identified as:
   b. Allergen
   c. Cause burns
   d. Corrosive
   e. Flammable
   f. Heavy Metal
   g. Lachrymator
   h. Neurotoxin
   i. Oxidizer
   j. Peroxide or Peroxide forming
   k. Reactive
   l. Sensitizer
   m. Toxic
   n. Unstable
   o. Water Reactive
3. **High Hazard Operations**
   a. High hazard operations include work with particularly hazardous chemicals that are identified as:
      i. Carcinogens
      ii. Reproductive Toxins
      iii. Highly Toxic
      iv. Extremely Toxic
      v. Fatal
      vi. Poison
      vii. Severe allergens
      viii. Causes severe burns
      ix. Explosive
      x. Pyrophoric
      xi. Strong oxidizers
      xii. Strong sensitizers
   b. Any chemical High Toxicity which fits any one of the following:
      i. Is identified or described as highly toxic in the MSDS or on the label.
      ii. Meets the OSHA definition of highly toxic:
      iii. The median lethal dose (LD50) is equal to or less than 50 mg/kg of body weight when administered orally to rats.
      iv. The median lethal dose (LD50) is equal to or less than 200 mg/kg of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of rabbits.

v. The median lethal concentration (LD 50) in air is equal to or less than 200 parts per million (ppm) by volume or less of gas or vapor, or equal to or less than 2 mg per liter or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to rats.

vi. The Threshold Limit Value (TLV) or Permissible Exposure Level (PEL) is equal to or less than 5 ppm or 5 milligrams per m3.

vii. The median tolerance limit is equal to or less than 10 ppm by weight of material in water, or the median aquatic lethal concentration is equal to or less than 10 mg/L of material, when administered for 96 hours to a medium sensitivity warm water or cold water species of fish.

viii. Is identified or described in the medical or industrial hygiene literature as being acutely toxic.

c. Carcinogens

i. Any chemical which fits any one of the following:

1. Is identified or described as a carcinogen in the MSDS or on the label.
2. Is regulated by OSHA as a carcinogen.
3. Is listed under the category known to be carcinogens or reasonably anticipated to be carcinogenic in the Annual Report of Carcinogens published by the National Toxicology Program (NTP).
4. Is listed under Group 1 Carcinogenic to humans, Group 2A or 2B by the International Agency for Research on Cancer Monographs (IARC).

Appendix E- IV. Maximum Allowable Size of Containers and Portable Tanks

	Flammable Liquids			Combustible Liquids	
Container Type	**Class IA**	**Class IB**	**Class IC**	**Class II**	**Class III**
Glass	1 pt	1 qt	1 gal	1 gal	5 gal
Metal (Other than DOT Drums) or Approved Plastic	2 gal	5 gal	5 gal.	5 gal	5 gal
Safety Cans	2 gal	5 gal	5 gal	5 gal	5 gal
Metal Drums (DOT Spec.)	60 gal.	60 gal	60 gal	60 gal	60 gal
Approved Portable Tanks	660 gal	660 gal	660 gal	660 gal	660 gal

Note: 1 pt = 413.18 cm^3, 1 qt. = 946.35 cm^3 , 1 gal = 0.00379 m^3

Appendix E-V. Solvent Flammability Characteristics

Flash Points, Boiling Points, Ignition Temperatures, and Flammable Limits of Some Common Flammable Laboratory Chemical

Chemical	Class	Flash Point	Boiling Point	Ignition Temperature	Flammable (% By Volume Air)	Limit (% By Volume Air)
		(0C)	(0C)	(0C)	Lower	Upper
Acetaldehyde	1A	-37.8	21.1	175.0	4.0	60.0
Acetone	1B	-17.8	56.7	465.0	2.6	12.8
Benzene	1B	-11.1	80.0	560.0	1.3	7.1
Carbon Disulfide	1B	-30.0	46.1	80.0	1.3	50.0
Cyclohexane	1B	-20.0	81.7	245.0	1.3	8.0
Diethyl Ether	1A	-45.0	35.0	160.0	1.9	36.0
Ethyl Alcohol	1B	12.8	78.3	365.0	3.3	19.0
N-Heptane	1B	-3.9	98.3	215.0	1.05	6.7
N-Hexane	1B	-21.7	68.9	225.0	1.1	7.5
Isopropyl Alcohol	1B	11.7	82.8	398.9	2.0	12.0
Methyl Alcohol	1B	11.1	64.9	385.0	6.7	36.0
Methyl Ethyl Ketone	1B	-6.1	80.0	515.6	1.8	10.0
Pentane	1A	-40.0	36.1	260.0	1.5	7.8
Styrene	1B	32.2	146.1	490.0	1.1	6.1
Toluene	1B	4.4	110.6	480.0	1.2	7.1
P-Xylene	1C	27.2	138.3	530.0	1.1	7.0

Appendix E-VI. Corrosive Chemicals

Acids	Bases	Others
Acetic	**Ammonium Hydroxide**	**Bromine**
Chloracetic	**Barium Carbonate**	**Glutaraldehyde**
Chromic	**Barium Hydroxide**	
Cresylic	**Calcium Hydroxide**	
Hydrochloric	**Calcium Oxide**	
Hydrofluoric	**Potassium Carbonate**	
Nitric	**Potassium Hydroxide**	
Perchloric	**Sodium Carbonate**	
Periodic	**Sodium Hydroxide**	
Phosphoric	**Trisodium Phosphate**	
Sulfuric		

Appendix E-VII. Water Reactive Chemicals

Trivial Names	**Molecular Formulas**
Alkali Metals	Na, Li, K
Alkali Metal Hydrides	LiH, CaH2, LiAlH4, NaBh2
Alkali Metal Amides	NaNH2
Metal Alkyls	RLi, RNa, R3Al, R2Zn
Grignard Reagents	RMgX
Halides of Nonmetals	BCl3, BF3, Pcl5, SiCl4, S2Cl2
Inorganic Acid Halides	POCl3, SOCl2, SO2Cl2
Anhydrous Metal Halides	AlCl3, TiCl4, ZrCl4, SnCl4
Metal Carbonyls	Ni(CO)4, Fe(CO)5, Co2(CO)8
Carbides	CaC2
Phosphorous Compounds	Red P ,White P, P2O5
Organic Acid Halides and Anhydrides of Low Molecular Weight	
Metal Powders	As Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr
Nonmetal Hydrides	B2H6, PH3, AsH3
Nonmetal Alkyls	R3B, R3P, R3As

Appendix E-VIII. Peroxide Forming Compounds

LIST A: Severe Peroxide Hazard On Storage With Exposure To Air

Discard Within 3 Months

Diisopropyl Ether (Isopropyl Ether)	Potassium Amide
Divinylacetylene (DVA)	Sodium Amide (Sodamide)
Potassium Metal	Vinylidene Chloride (1,1-DiChloroethylene)

LIST B: Peroxide Hazard On Concentration

Do Not Distill Or Evaporate Without First Testing For The Presence Of Peroxides.
Discard Or Test For Peroxides After 6 Months

Acetaldehyde Diethyl Acetal (Acetal)	Ethylene Glycol Dimethyl (Glyme)
Cumene (Isopropyl Benzene)	Ethylene Glycol Ether Acetates
Cyclohexene	Ethylene Glycol Monoethers (Cellosolves)
Cyclopentene	Furan
Decalin (Decahydronaphthalene)	Methylacetylene
Diacetylene (Butadiene)	Methylcyclopentane
Diethyl Ether (Ether)	Tetrahydrofuran (THF)
Dioxane	Vinyl Ethers

LIST C: Hazard Of Rapid Polymerization Initiated By Internally Formed Peroxides

Normal Liquids
Discard Or Test For Peroxides After 6 Months

Chloroprene (2-Chloro-1,3-Butadiene)	Vinyl Acetate
Styrene	Vinylpryidine

Normal Gases
Discard After 12 Months

Butadiene	Vinylacetylene (MVA)
Tetrafluoroethylene (TFE)	Vinyl Chloride

Appendix E-IX. Data for Common Gases

Gas	Threshold Limit Values, ppm1	Flammability Limits in Air % By Vol2	Major Hazards
Acetylene (Dissolved)	Not Established*	2.5- 81.0	
Ammonia (Liquid)	25	15-28	Toxic
Argon	Not Established (Nontoxic)	None	Asphyxiant
Boron Trifluoride	1	None	Toxic; Causes Burns
1,3-Butadiene (Liquid)	10	2-11.5	Flammable; Skin Irritant; Suspect Carcinogen
Butane (Liquid)	Not Established*	1.9-8.5	Flammable
Carbon Dioxide (Liquid)	5000	None	Flammable; Toxic
Carbon Monoxide	50	12.5-74.0	Toxic; Severe
Chlorine (Liquid)	0.5	None	Irritant; Causes Burns; Corrosive
Ethane (Liquid)	Not Established*	3.0-12.5	Flammable; Asphyxiant
Ethylene	Not Established*	3.1-32.0	Flammable; Asphyxiant
Ethylene Oxide (Liquid Pure)	1 ppm	3.0-100.0	Flammable; Toxic Can Cause Burns When Trapped By Clothes Or Shoes; SuspectCarcinogen
Helium	Not Established	None	Asphyxiant
Hydrogen	Not Established	4.0-75.0	Flammable; Asphyxiant
Hydrogen Bromide (Liquid)	3	None	Toxic; Causes Burns; Corrosive
Hydrogen Chloride (Liquid)	5	None	Toxic; Causes Burns; Corrosive
Hydrogen Fluoride (Liquid)	3	None	Toxic; Causes Severe Slow Healing Burns; Corrosive
Hydrogen Sulfide (Liquid)	10	4.3-45.0	Toxic; Flammable; Irritant
Methane	Not Established	5.3-14.0	Flammable; Asphyxiant
Methyl Bromide	5	13.5-14.5	Toxic; Causes Burns

(Liquid)			
Methyl Chloride (Liquid)	50	10.7-17.4	Toxic; Flammable
Methyl Mercaptan (Liquid)	0.5	Unknown	Toxic; Flammable
Nitrogen (Nontoxic)	Not Established	None	Asphyxiant
Nitrogen Dioxide (Liquid)	3	None	Toxic; Corrosive
Oxygen	Nontoxic	None	Highly Reactive
Phosgene (Liquid)	0.1	None	Toxic
Propane (Liquid)	Not Established*	2.2-9.5	Flammable; Asphyxiant
Sulfur Dioxide (Liquid)	2	None	Toxic; Causes Burns
Vinyl Chloride	5	4.0-22.0	Flammable; Causes Burns, Human Carcinogen

Not Established (Non-Toxic-Produces Anesthetic Effects)

1 Threshold Limit Values (1990-1991) ACHIH, Cincinnati, Ohio

2 Zabetakis, M.G. Flammability ACharacteristics ofCombustible Gases And Vapors Bulletin 627, U.S. Bureau of Mines, U.S. Gov't Printing Office,Washington, D.C.

Appendix F- I. Eye and Face Protection Selection Chart

Source	Assessment of Hazard	Protection
Impact- Chipping, grinding, machining, masonry work, working, sawing, drilling, chiseling, powered fastening, riveting, sanding	Flying fragments, objects, large chips, particles of sands, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes (1), (3), (5), (6), (10). For severe exposure use face shield.
Heat- Furnace operations, pouring, casting, hot dipping, and welding.	Hot sparks Splash from molten metals High temperature exposure	Face shields, goggles, spectacles with side protection. For severe exposure use face shield. See notes (1), (2), (3). Face shield worn over goggles. See notes (1), (2), (3). Screen face shields, reflective face shields. See notes (1), (2), (3).
Chemicals- All chemical handling	Splash Irritating Mists	Goggles, eyecup and cover types. For severe exposure use face shield. See note (3), (11). Special purpose goggles.
Dust- Woodworking, buffing, general dusty condition s	Nuisance Dust	Googles, eyecup and cover types. See note (8).
Light Radiation Welding: Electric arc	Optical Radiation	Welding helmets or welding shields. Typical shades: 1 0-14. See notes (9), (12).
	Optical Radiation	Welding goggles or welding face shield. Typical shades: gas welding 4 - 8, cutting 3 - 6, brazing 3 - 4. See note (9).
Cutting, torch brazing, torch soldering	Optical Radiation	Spectacles or welding face shield. Typical shades 1.5 - 3. See notes (3), (9).

Notes for Eye and Face Protection Selection Chart

i) Care shall be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards shall be provided.
ii) All safety glasses must have side shields in place. This is minimum protection.
iii) Face shields shall only be worn over primary eye protection (spectacles or goggles).
iv) Persons whose vision requires the use of prescription lenses must wear either protection devices fitted with prescription lenses or protective devices designed to be worn over regular prescription eyewear.
v) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It shall be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.
vi) Caution shall be exercised in the use of metal frame protective devices in electrical hazard areas.
vii) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.
viii) Welding helmets or face shields shall be used only over primary eye protection (spectacles or goggles).
ix) Eye and face protection shall be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.
x) Operations involving heat may also involve light radiation. Protection from both hazards must be provided.
xi) Protection from light radiation is directly related to filter lens density. Select the darkest shade that allows task performance. Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.

Appendix E-II. Hand Protection Chart

Key: E = Excellent G = Good X = Do Not Use

	Natural Rubber	Neoprene	Nitrile	PVA	PVC	Viton
Acetaldehyde	G	G	X	X	X	
Acetic Acid, Glacial	G	E	G	X	X	
Acetone	G	G	X	X	X	
Benzene	X	X	X	G		
Butanol	E	E	E	X	G	
Butyl Acetate	X	X	G	E	X	
Cellosolve (2-ethoxyethanol)	X	E	G	X	X	
Chloroform	X	X	X	E	X	
Ethyl Acetate	G	G	X	G	X	
Ethylene Glycol	E	E	E	X	E	
Formaldehyde (>10%)	G	G	E	X	G	
Hexane	X	E		G	X	E
Isoproponal	E		E	X	G	E
Methanol	E	E		X	E	
Methylene Chloride	X	X		G	X	G
Methyl Ethyl Ketone	G	X	X	G	X	
Methyl Isobutyl Ketone	G	X	X	G	X	
Mineral Spirits	X	G	E	E	X	
Nitric Acid (70%)	X	E	X	X	G	
Perchlorethylene	X	X		E	X	E
Sodium Hydroxide	E	E	E	X	G	
Sulfuric Acid (95%)	X	G	X	X	E	
Toluene	X	X		G	X	E
1,1,1-Tirchloroethane	X	X		E	X	
Xylene	X		X	E	X	E

PVC = Polyvinyl Chloride
PVA= Polyvinyl Alcohol

Appendix G-I. Accident Report

Accident Report
Wingate University

Name _____ Date _____

☐ Student ☐ Faculty ☐ Staff ☐ Other

Location _____

Course _____ Instructor _____

Type of Accident

Injury:
- ☐ Glass cut _____
- ☐ Heat burn _____
- ☐ Cold burn _____
- ☐ Contact with a corrosive _____
- ☐ Inhalation contact with _____
- ☐ Electrical _____
- ☐ Other _____

Was the Safety Shower ☐ or Eyewash Fountain ☐ used? No ☐

First Aid: _____

_____

_____

Was the Infirmary contacted? Yes No

Was 911 or EMP called? Yes No

Other actions taken: _____

_____

_____

Follow-up:

How was the injury the next day? _____

How was the injury the next week? _____

Spill (greater with 100 mL)

Chemical _____ Amount _____

Cleanup _____

_____

Fire: Chemical _____ Amount _____

Response _____

_____

Appendix F-II. Eye Wash Plumbed Station Weekly Inspection Check List

Eye Wash Plumbed Station Weekly Inspection Check List

Building: **Lab room#:**

Weekly Checklist (date and initial below)

1) Is there a clear passage and easy access to the eyewash station?
2) Turn on the eyewash. Is the water flowing to allow rinsing of the body area?
3) Is the lever accessible?

Date	Initials	Date	Initials	Date	Initials

If the answer is NO, please contact The Safety Committee immediately. Keep completely filled sheets in your safety binders for your records.

Appendix F-III. Safety Shower Plumbed Station Weekly Inspection Check List.

Safety Shower Plumbed Station Weekly Inspection Check List

Building: **Lab room#:**

Weekly Checklist (date and initial below)

1) Is there a clear passage and easy access to the shower station?
2) Turn on the shower. Is the water flowing to allow rinsing of the body area?
3) Is the lever accessible?

Date	Initials	Date	Initials	Date	Initials

If the answer is NO, please contact The Safety Committee immediately. Keep completely filled sheets in your safety binders for your records.

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